

Weather Note

REDEFINITION OF HURRICANE DORA OVER THE GULF STREAM

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The oscillatory motions and changes in intensity of hurricanes have been reviewed and commented on with some regularity ever since they have come under routine radar surveillance. Hurricane Dora provided another such opportunity for meteorologists to observe changes apparently resulting from the hurricane's passing over the Gulf Stream, east of Daytona Beach, Fla. Hurricane Dora was under the surveillance of several land-based and air-borne radars at various times as it approached the mainland but the Weather Bureau's 10-cm.WSR-57 radar at Daytona Beach afforded the best continuous surveillance during the period September 8-10, 1964.

On the morning of the 9th, radar observers at Daytona Beach noted a rapid change in both the definition of the hurricane's precipitation pattern and the radar track of the eye. This change was characterized by the wall cloud region's becoming much better defined, accompanied with an erratic shift of the radar track from westward to northward. Previous to this period, radar return from precipitation echoes of the wall cloud were poorly defined if not entirely absent, thereby necessitating the employment of logarithmic spiral overlays to fix the center [1]. Following this abrupt change, approximately 120 n.mi. off the northeastern Florida coast, Dora retained its improved radar definition until landfall.

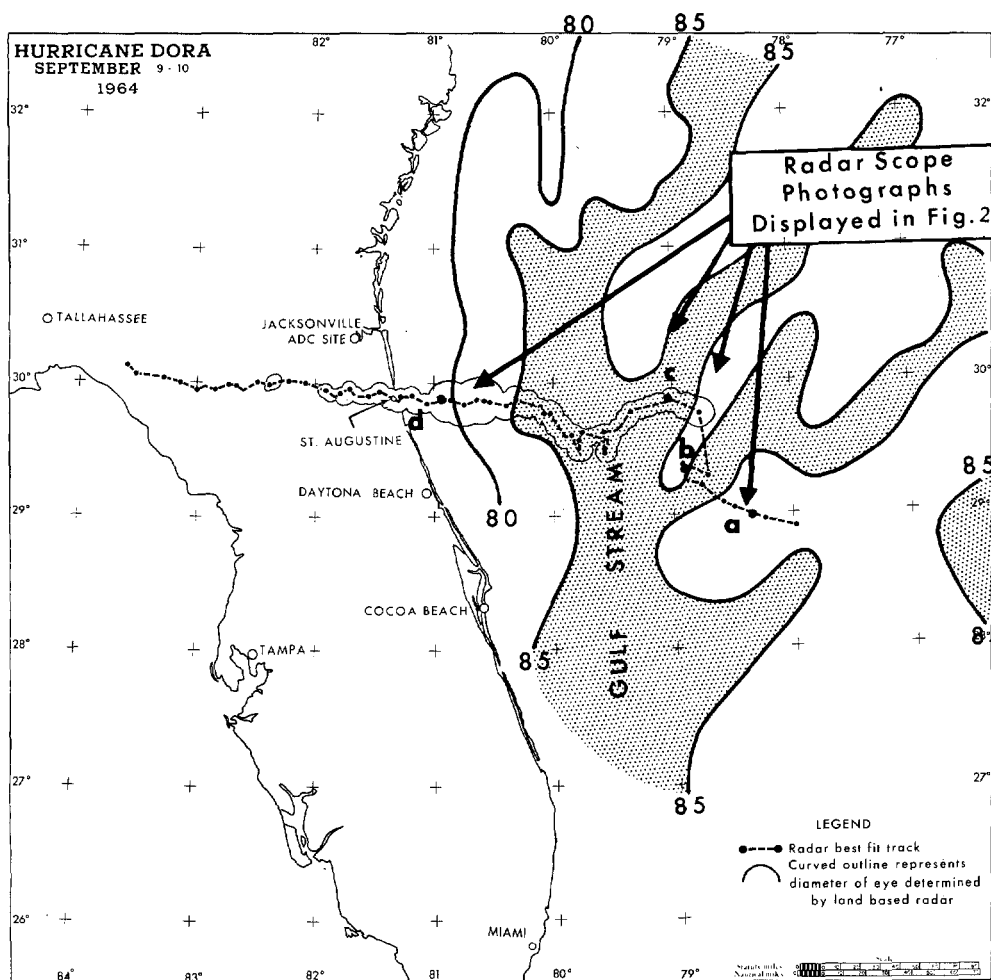


FIGURE 1.—Best-fit track of hurricane Dora as defined by Daytona Beach radar, and sea surface temperature (°F.) September 9-10, 1964. Letters refer to sections of figure 2.

Since the location of the rapid improvement in definition of the wall cloud was in the vicinity of the Gulf Stream, it is reasoned that the passage of Dora over these warm waters might have had some connection with the transformation. To suggest that the change was merely a factor of the hurricane's reaching an optimum observation range would seem inadequate. This is supported in part by the fact that the broad clear channel which had existed between the weakly defined wall cloud and the rainshield of Dora did not become rapidly filled with precipitation echoes until the transformation period.

An investigation was made to see if there was any connection between the transformation and the Gulf Stream. Sea surface temperature composite charts prepared by the U.S. Naval Oceanographic Office were obtained to locate the axis of the Gulf Stream with relation to the radar track of hurricane Dora. Since

hurricanes have a cooling effect on the sea surface [2], the composite temperature map (fig. 1) for the period September 4–8 was chosen. This chart gives the best representation of the Gulf Stream's location just prior to hurricane Dora's crossing. Examination of Dora's radar track reveals that the Daytona Beach radar displayed a poorly defined eye (fig. 2a) east of the Gulf Stream at 0458 GMT on September 9, 1964. At 0900 GMT (fig. 2b) the hurricane took on a northward course along the axis of the Gulf Stream (fig. 1). By 1106 GMT Dora turned west and was crossing the Gulf Stream (fig. 2c) becoming well defined with an extended area of precipitation and spiral bands displayed on the radar (fig. 2d) by 0155 GMT, September 10. It is of further interest to note that following its initial abrupt jump to the north Dora proceeded to describe two cycloidal loops before passing out of the Gulf Stream area [3].

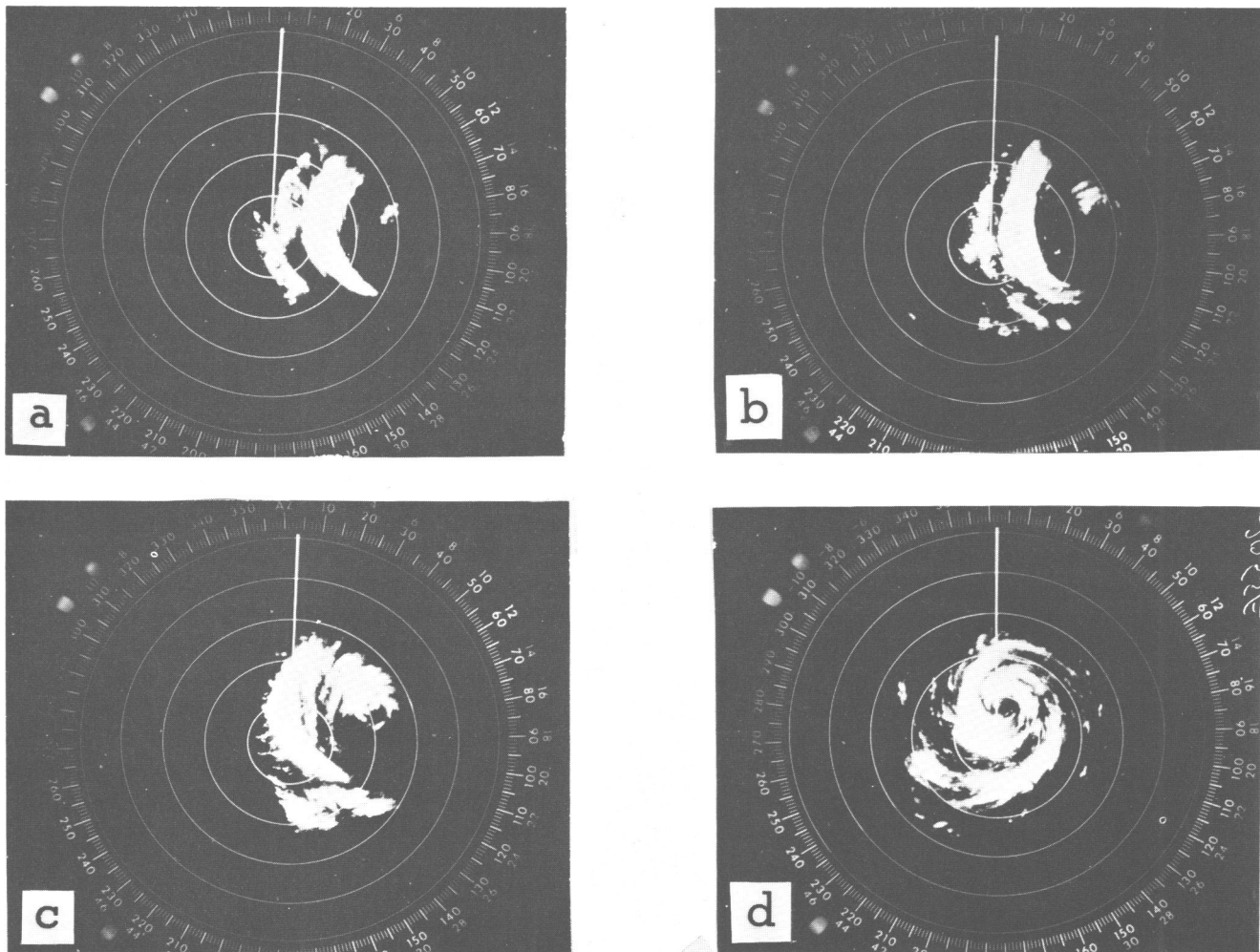


FIGURE 2.—Hurricane Dora as viewed on Daytona Beach WSR-57 radar (with 50 n.mi. range markers). (a) Eye 150 n.mi. east of Daytona Beach on westerly course approaching the Gulf Stream at 0458 GMT, September 9. (b) Eye at 0900 GMT, September 9 about 130 n.mi. east-northeast of station on northerly course along axis of Gulf Stream. (c) Developing eye at 1106 GMT 100 n.mi. east of station on westerly course crossing Gulf Stream. (d) Fully developed eye at 0155 GMT September 10 just north of Daytona Beach after having crossed the Gulf Stream.

There were no dropsonde data available from reconnaissance aircraft in the storm at the time it crossed the Gulf Stream. However, dropsonde data before and after the storm passed over the Gulf Stream indicate a pressure drop of 10 mb. (972–962 mb.) representing some intensification which no doubt was reflected in the improved radar definition of the eye wall area.

This is in agreement with a study of Perlroth [4] of hurricane Esther (1961) in which he related periods of intensification and improvement of the definition of the eye wall region (from aircraft reconnaissance data) with periods when the hurricane crossed warm tongues of water in the North Atlantic.

The above data suggest the idea that the Gulf Stream contributed to the redefinition of hurricane Dora as observed by the Daytona Beach radar. However, the connection of the Gulf Stream and the abrupt change in the

radar track and the later cycloidal loops is not entirely clear. Fisher [2] suggests that the speed with which the storm crossed this stream of warm water may be a factor. It is not within the scope of this investigation to make any profound conclusions, but only to present observations and to indicate the need for further research in this area as more cases become available.

REFERENCES

1. H. V. Senn and H. W. Hiser, "Tracking Hurricanes with Radar," *Proceedings*, 6th Weather Radar Conference, Mar. 1957, pp. 165–170.
2. R. Fisher, "Hurricanes and the Sea Surface Temperature Field," National Hurricane Research Project Report, No. 8, U.S. Weather Bureau, June 1957, pp. 1–30.
3. U.S. Weather Bureau, *Report on Hurricane Dora; August 28–September 16, 1964*, 71 pp.
4. I. Perlroth, "Intensity of Hurricanes in Relation to Sea Surface Energy Exchange," Progress Report. P-31, National Oceanographic Data Center, Suitland, Md., July 1964, 15 pp.

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CORRECTION NOTICE

Vol. 94, No. 6, June 1966:

P. 401, col. 2:

In the equation for Y_{12} , north zone, the constant term should be negative (–2402.1).

P. 402, table 1(a):

Predictors 5 and 6 under Latitude should be P_{52} and P_{69} instead of P_5 and P_6 .

Predictors 3 and 5 under Longitude should be P_{75} and P_7 instead of P_{10} and P_3 .